REPORT-IN-PROGRESS

Report 3:

LANDOWNER RISK ASSESSMENT IN THE SOUTHERN WILDLAND-URBAN INTERFACE

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Landowner Risk Assessment in the Southern Interface

Introduction

One of the most important educational messages for landowners in the wildland-urban interface (WUI) is that they must assume responsibility for protecting themselves. Under extreme fire situations, fire control resources are often insufficient to protect all the threatened structures. Where landowners have assessed their particular risk and reduced that risk through landscape and fuel modifications, homes are much more likely to survive WUI fires. If landowners are to assume this responsibility, educational and training materials must present them with clearly defined and easily understood methods to assess risk and evaluate it relative to their other homeowner objectives and values (such as water conservation, wildlife habitat, and natural ambience). Accordingly, this part of the project has two major objectives: 1) develop a simple, but complete, risk assessment procedure for WUI (and other rural) landowners across the South; and, 2) design guidelines for presenting, in a variety of technology transfer venues, the assessment procedure as well as related information about wildland fire, fuel reduction methods, landscaping for multiple objectives and other relevant topics.

This report-in-progress describes our first year evaluation of the many risk assessment systems that are used around the country and the initial recommendations for a southern WUI homeowner assessment procedure. These recommendations will be critically reviewed by fire management organizations in all southern states and then revised to reflect their experience. The report also examines some of the strengths of the various homeowner guidelines for fire protection. Those strengths will be critical as we design the overall guidelines during the second year of the project.

Hazard and Risk Assessment Procedures

In order to respond appropriately to the potential fire danger in the wildland-urban interface (WUI), homeowners must be able to understand and assess their individual risk, where risk is defined as the likelihood that their home may be exposed to, or ignited by, a wildfire. A fundamental component of 'risk' is the 'hazard' of the fuels on and surrounding the homeowner's property. Fire hazard describes the characteristics of fuels that determine ease of ignition and/or resistance to fire control (National Fire Protection Association 1997).

A variety of guidelines for hazard and risk assessment have been produced by both private and public agencies, at national, state and local levels. Many of the guidelines apply to the western United States and attention has only recently begun to focus on the Southeast with most efforts in Florida and Virginia. The first major task in this project was a review of other risk assessment systems

to determine an appropriate approach for the South that would strengthen the specific assessment of fuel hazards. The results of that review are described below.

Comparison of Existing Assessment Procedures

Hazard assessments have usually focused on one of three levels of detail or scales: statewide, communities, or individual landowners. At a state or region-wide scale, hazard evaluations provide a basis for land use planning and development, regulatory issues, mitigation planning and resource allocation. Key factors in those assessments have generally been vegetative fuels (types and amounts), weather (especially the frequency of extreme conditions), topography, and more recently, asset values such as residential density. Computerized mapping and geographic information systems (GIS) have greatly facilitated these evaluations in recent years.

California began such assessments in the early 1970s, and their most recent version is a statewide Fire Hazard Mapping based on methodologies developed in conjunction with the 1996 California Fire Plan (California Board of Forestry 1996). The University of California Forest Products Laboratory (UCFPL) provided a thorough review of these and several other assessment methods in 1999 (California Department of Forestry and Fire Protection and UCFPL 1999). Similar statewide assessments have been completed in New Mexico (Lightfoot et al. 1999) or are nearing completion in Florida. Although the statewide protocols can be used by individual communities or landowners to determine if they are in a high hazard/risk zone, they do not necessarily reflect the actual risk for individual landowners in that zone.

The second level of detail is hazard evaluation for local municipalities and communities. This is probably the most common assessment procedure used around the country. Risk and hazard assessments vary in detail, but most include some evaluation of vegetation around homes or other structures. Common variables are the general vegetation type (e.g., shrubs, forests or landscape plants) and proximity of vegetation to structures. More detailed assessments may: classify vegetation according to one of the 21 National Fire Danger Rating System (NFDRS) fuel models (USDA Forest Service 1988) or 13 Fire Behavior fuel models (Anderson 1982); recognize some other aspect of the density or size of the natural vegetation; or try to differentiate between native and non-native plants. Other important factors in most of these community assessments include road characteristics, signage, building construction (especially roofs, siding and decks), utility placement, water sources, and fire history. Most assessment procedures are modeled after the hazard rating systems outlined in “NFPA 299: Standard for the Protection of Life and Property” (NFPA 1997, with a new version scheduled for late 2002), or described in the booklet “Wildland/Urban Interface Fire Hazard Assessment Methodology” (National Wildland/Urban Interface Fire Protection Program 1998). These second level assessment procedures usually result in a mathematical summary of rating scores for each of the factors included in the evaluation and a qualitative

description of hazard and risk (low, medium, high) depending on the total rating score. The actual numerical rating is significant only for the system from which it was derived.

Specific examples of these second level assessment procedures include:

1. Wildfire Hazard Identification and Mitigation System (WHIMS), a system developed in Colorado, with a base hazard factor (topography, fuels, building construction, landscaping) adjusted by defensible space, accessibility, fire protection response and water availability, and a final Overall Wildfire Hazard Rating scored as 0-10 for any given site.
2. Montana Department of State Lands System, developed for subdivisions and developments up to 1000 acres in size, with total rating scores from 66 to 210 points.
3. Virginia Department of Forestry System, which includes fuels, slope, structural construction and various infrastructure features (access, water sources, etc) with a maximum rating score of 73 points.
4. Hazard Assessment Booklet for Florida Homeowners, which is being prepared by the Florida Division of Forestry and should be released in 2002; rating factors include access, vegetation, building construction, utilities, fire protection resources and subdivision design; the scoring system follows the NFPA 299 standard closely, but includes added details at the community level related to the percentages of homes that have different features.

These last features of the new Florida assessment procedure strengthen the utility of the assessment process for communities, but they also illustrate an important shortfall of the community-level assessment procedures. The tabulated total scores and quantitative or qualitative fire risk descriptions are for a much larger area than individual landowner properties. Although homeowners can utilize most of the evaluative procedure and factors for their property, their total scores may not be comparable to the risk categories for an entire community, which may require more assessment information than is available to individual landowners. Thus, assessment procedures developed for the third level of detail, individual lots or properties, are critical and necessary for homeowners to determine their particular risk.

Examples of hazard assessments for individual properties are diverse and generally designed for application only in the western states. The Brian Barrette System for Structural Vulnerability (Barrette 1999) was designed for use in California. The first factor was the (California) State Responsibility Area fire hazard rating that is based on regional fuels, weather and topography. Individual property factors include roofing composition, siding, vegetation clearance, roads and signage, chimneys, external features (decks, propane tanks and stacked wood), water supply and location on the slope. Each of these factors is scored on a 1 to 3 scale, with clearly understood descriptions for each rating. Homeowners can easily apply this procedure to their home and property. However, the total score (maximum 30 points) is heavily weighted by structural features that contribute to fire risk; vegetative fuel hazards contribute to a

maximum of only 9 possible points in the scoring. In designing a risk/hazard assessment procedure for homeowners in the South, home construction features and risk of ignitability should be included as important factors, as in the Barrette system. But vegetative fuel hazards and landscaping concerns should also receive significant focus so that landowners can optimize fire hazard mitigation, as well as other objectives.

A second set of hazard assessment guidelines specifically for landowners is included in "Is Your Home Protected from Wildfire Disaster: A Homeowner's Guide to Wildfire Retrofit" published by the Institute for Business and Home Safety (IBHS 2001). For assessing individual properties, the IBHS guidelines focus on a set of questions related to wildfire occurrence, topography, nearby vegetation and exterior features such as woodpiles and fences. The questions can be easily answered by landowners and do not include numerical ratings as in the systems discussed previously. The questions are followed by general descriptions of three risk categories, with one of the key factors being the presence or absence of native vegetation in landscaping. Unfortunately, low risks are associated with native vegetation in the landscape and high risks with using non-native vegetation. This feature, by itself, greatly limits the use of this risk assessment in the South where high fire hazard is most often associated with native vegetation, especially various native shrub species.

A third example of specific property assessment procedures is the brochure designed for use in Florida which gives homeowners some general descriptions of surrounding natural vegetation that would be considered low, medium or high risk in the case of an approaching fire (Monroe and Long 2000). The assessment only requires a look around the property at the density and continuity of shrubs, grass, young pines, and ladder fuels such as vines, and an evaluation of whether they could see through the vegetation on adjoining properties. For many landowners, such a simple procedure may be an important educational method to encourage them to assess fuel hazards and take whatever actions are necessary to reduce the hazards, but it does not directly address some other factors that affect risk to homes (such as construction features).

Included with most of these risk assessment procedures are standard guidelines for WUI fire protection. For example, almost all assessments include some measure of defensible space, which refers to an area between homes and adjacent wildlands where vegetation has been removed or modified for fire protection (NFPA 1997). Defensible space guidelines are based on research on the effects of radiant heat (e.g., Cohen 2000) and surveys of homes threatened by WUI fires (e.g., Abt et al. 1987, Graham 1988). However, the geographic distribution of this research is limited, as are the ecosystems in which it was conducted. Few studies have been conducted in the southern United States.

Evaluation of Other Homeowner Guidelines

Many states and local organizations/agencies have landowner brochures or publications that do not directly describe risk assessment, but by listing the

many things a landowner can do in landscaping or home construction they imply hazardous conditions. Examples of these materials include:

1. Living with Fire, A Guide for the Homeowner, a 12-page newsletter that was initially designed by the University of Nevada, Reno, Cooperative Extension Service, which has now been adapted by many western states; the major focus of the publication is on making homes defensible - in construction, design and landscaping, but it also includes articles on the role of fire in natural ecosystems, fire behavior in local ecosystems, and what to do when a fire approaches (Smith and Skelly 1999).
2. Creating Wildfire-Defensible Zones and Fire Wise Plant Materials, two landowner publications (eight pages each) prepared by the Cooperative Extension Services in Colorado and New Mexico; similar brochures in many other states outline details for landowners to follow in home construction, landscaping and plant selection in interface developments (Dennis 1999a and b).
3. Are You Firewise Florida?, a brochure with landscaping and construction checklists, guidelines and a landscaping illustration (Florida Division of Forestry 2000).
4. Fire Safe California Community Action Guide produced with the assistance of the Western Insurance Information Service and the California Fire Safe Council to help interface communities understand why they are at risk and develop recommendations for reducing that risk (California Department of Forestry and Fire Protection 1996).
5. Landscaping for Wildfire Prevention: Protecting Homes on the Wildland/Urban Interface, a brochure prepared by the University of Idaho Cooperative Extension Service, that describes a number of topics related to fire history, landscaping, fire prevention features, and plant materials; it also includes a home fire risk rating procedure that is strongly influenced by structure design, slope, and other important fire factors in the northern Rocky Mountains (Carree et al. 1998).

Components of a Homeowner Assessment Procedure for the South

The review of hazard/risk assessment procedures indicated that no satisfactory system currently exists for landowners in the South to assess their own property and arrive at a uniform conclusion about their risk. Current systems (excluding community or state level methods) emphasize either structural factors or vegetative fuels, but seldom both. The goal of this project is to develop an improved risk assessment procedure for homeowners that can be applied across the southern United States, while maintaining enough detail to offer an accurate site-specific assessment of risk.

Attributes of a new system for the Southeast will include some of the best points of these other methods, and will contain both home risk and fuel hazard components. A home risk component is essential because of the significant relationship between home vulnerability to fire (especially from embers and other

firebrands) and the use of wood for exterior surfaces. All risk rating systems that look at home construction score wood substantially higher than non-flammable exteriors. The risk component will focus on home construction materials (roof, siding/walls, soffits, skirting and other exterior structures) with numerical scoring similar to the Barrette System in California: two or three numbers for each construction category, with clear descriptions for each (e.g., brick walls vs wood siding; type of skirting under deck or mobile home; metal, shingle or wood roofing). The total scores for this relatively brief assessment will be qualitatively assigned to two risk categories: 'low' or 'at risk' in the event of an approaching fire. A draft of this portion of the assessment is nearing completion and will contain both a brief description of each construction category and a sample rating sheet.

The second assessment component, fuel hazard, will evaluate vegetation on, or surrounding, individual properties and will lead to recommendations for appropriate mitigation measures. Most current hazard assessments use simple descriptions of the vegetation, such as type of vegetation (e.g., grass, brush, timber) and height (low, medium, high), to characterize the vegetation fuel component. Refinements to the fuel descriptions include categorizing vegetation by the appropriate (or closest) fire behavior or NFDRS fuel model. This method follows the procedures outlined in the new NFPA 299 scheduled for release in 2002. In Florida, both the new statewide hazard assessment and the homeowners' booklet classify fuels in vegetation classes (key species and height) that are, or can be, linked to specific fire behavior models. Such classifications provide the basis for further descriptions of fire behavior (and therefore hazard) from fuel model simulations. Detailed hazard assessments for wildland fuels produce a more accurate representation of fire behavior and hence the risk to structures, but they can be difficult to use by homeowners. For example, detailed fuel hazard assessments might require the user to identify species composition or differentiate between highly flammable and fire-resistant plant communities (e.g., Collins et al. 1996).

The fuel hazard assessment for the South will be based on the major forested and grassland ecosystems in the region, each of which contain WUI areas with some degree of modification. Within those ecosystems, WUI residential areas represent a continuum of vegetation patterns and associated fire risk that cannot be readily classified into a few risk categories by simply measuring the distance to, and size of, surrounding vegetation. We have completed descriptions of each ecosystem in terms of general structure and fire behavior (see report on Landscape Fire Risks), and are in the process of defining which fire behavior models can be used for these systems and their typical variation in the WUI. For each of the general vegetative ecosystems and physiographic regions in the South, we are defining the most critical fire weather conditions. Those weather conditions will be used as inputs to the standard fire behavior models (e.g., BEHAVE Plus (Andrews and Bevins 2001)). Model outputs will include fireline intensity and rate of spread for a wide variety of fuel loads and weather conditions. These fire behavior results will be aggregated into groups of ecosystems and fuel conditions that represent several categories of fire

risk (e.g., low, medium and high, depending on radiant heat loads and spread rates through fine fuels). This unique approach to defining WUI home fire risk will also allow us to provide more prescriptive recommendations for mitigating risk, depending on whether the risk is from fire intensity, rate of spread or a combination of the two. We have completed test runs for several shrub community conditions and are in the process of collecting input information for the models from fire behavior experts in each of the southern states. Fire behavior modeling in each of the systems will be completed during the fourth quarter, 2002.

For homeowners, the hazard assessment will be a simple, but multiple-step procedure using information generated in the landscape fire hazard simulations described above. Landowners will first determine the general ecosystem in which they are located and the risk category associated with that system. They will then compare yard and landscape features surrounding their home with a set of factors that could increase or decrease their general risk category. Rating scores and categories will be determined during the second year of the project, in conjunction with the fuel model simulations.

Designing Homeowner Guidelines

The national diversity of WUI homeowner guidelines provides many examples of technical content and presentation format. We want to incorporate the strengths of as many of these as possible to produce guidelines that are informative, and regionally relevant with enough local specificity to be useful. Following is a list of key attributes observed during our review of many different sets of guidelines.

1. Explanations of the natural role of fire.
   Descriptions of the role of fire in the environment include ecological benefits (Florida DOF 2002), the 'fire environment' (Smith and Skelly 1999), and types of fires (Carree and others 1998); although this is not covered in most public education materials, it is probably one of the most important topics for helping people to understand about wildland fire and should receive ample discussion in the southern guidelines.

2. General descriptions of fire prone ecosystems and/or general vegetation types.
   Examples range from vegetation fuel model characteristics and pictures (Firewise Communities 2001) to fairly detailed descriptions of different types of vegetation with four possible rating scores (Simmerman and Fischer 1990) to fire behavior characteristics in different local ecosystems (Florida DOF 2002, Smith and Skelly 1999, and other *Living with Fire* newsletters).

3. Landscaping features that increase/decrease risk.
This is the primary topic of most (if not all) guidelines, especially as they describe defensible space and/or zones of landscaping around the home.

4. Balancing firewise and other landowner values.
Homeowners are often more concerned about aesthetics, wildlife habitat, natural vegetation, energy conservation or other objectives than they are about their wildfire risk; and in many situations they may be at low fire risk and these other objectives are more appropriate for their landscaping concerns. This balance is not well represented in most guidelines but needs to be addressed in the southern guidelines. A notable exception, and useful source as the southern guidelines are developed, is the *Backyard Forest Stewardship/Wildfire Safety Program* in the state of Washington (Gibbs et al. 2000).

5. Informative pictures, illustrations and graphics, especially for the previous two points.
The value of such illustrations cannot be overestimated to clarify concepts and information for landowners. Current guidelines include many great examples and the southern guidelines must include similar graphics and pictures, especially for ecosystem and landscaping pattern descriptions, and defensible space/landscaping guidelines.

6. Presentation formats that are amenable to local adaptation.
Perhaps the classic example of this is the *Living with Fire* newsletter developed by the University of Nevada Cooperative Extension Service (Smith and Skelly 1999). The newsletter is available to landowners and other members of the public as a hard copy newsletter, but the template for the newsletter was also made available to other organizations on a CD for state or local adaptation. The newsletter is now published by a number of western states. The Minnesota Department of Natural Resources website (www.dnr.state.mn.us/firewise/homerisk.html) includes many of the above topics including an interactive home risk assessment form that could be modified for use in the South

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